Innovative Applications For Stranded Barrels of Oil

Conference

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Society of Petroleum Engineers

Role of seismic characterization in the revitalization of mature fields (example of Obod-Lacići oil field)

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THE MAIN GOALS OF SEISMIC STUDY

Seismic characterization study on Obod Lacići field resulted with segment of data that will be used in preparation of EOR project .

Main issue regarding fields suggested for EOR screening :

1. Fields covered with 3D seismic and exsisting sesmic interpretaion which were not elaborated-in that case reprocessing and reinterpretation of seismic is required
2. Fields covered with 3D seismic without seismic interpretation
3. Fields that are not covered with seismic-proposing 3D seismic aquisition and interpretation of data

Mission:

Interpretation of 3D seismic, solving of structural-tectonic settings and seismic attribute analysis

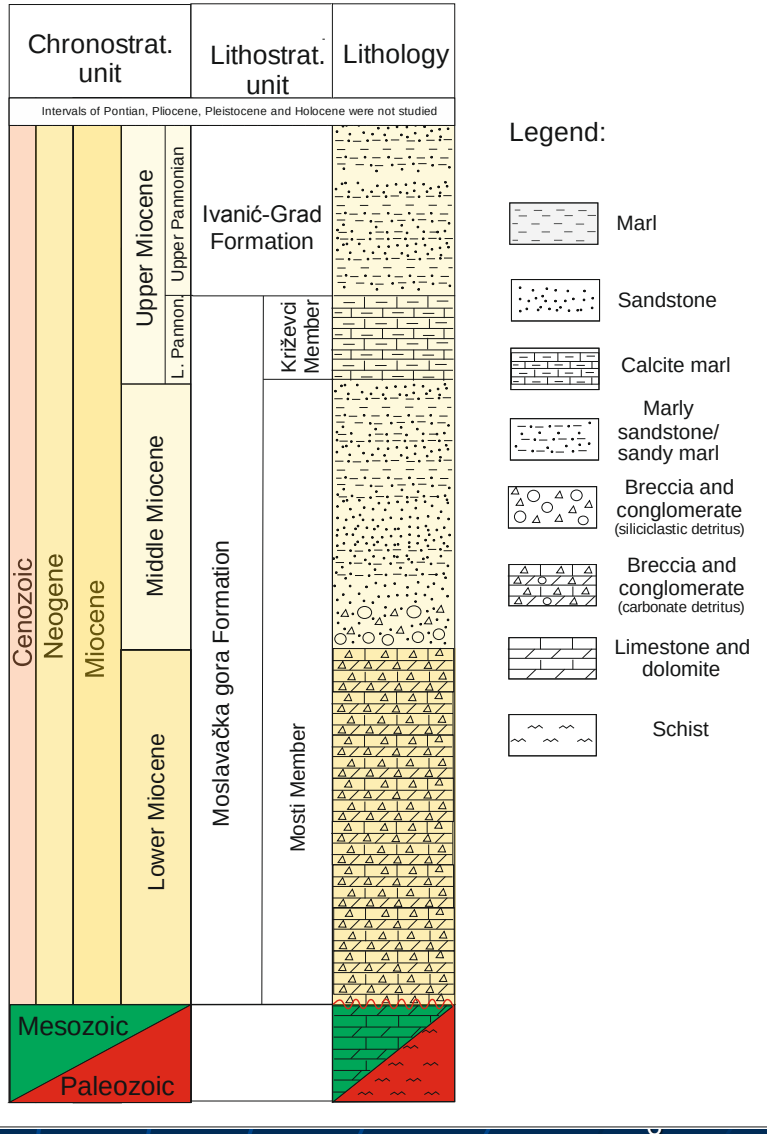
Expectations:

new / revised geological models (maps) and analysis of seismic attributes to determine reservoir quality and potential hydrocarbon saturation

1. BASIC INFORMATION ABOUT OBOD-LACIĆI FIELD
2. REPROCESSING OF SEISMIC
3. SEISMIC REINTERPRETATION
4. SEISMIC ATTRIBUTE ANALYSIS

1.

BASIC INFORMATION

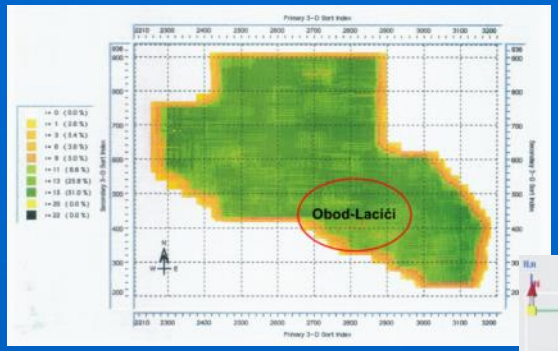


- discovered 1979. (Ob-10)
- NE Croatia-Drava depression
- reservoir is very complex with secondary porosity

(Badenian breccia and conglomerates and Mesozoic cataclased and fractured eruptive-sedimentary complex

2.

REPROCESSING OF SEISMIC

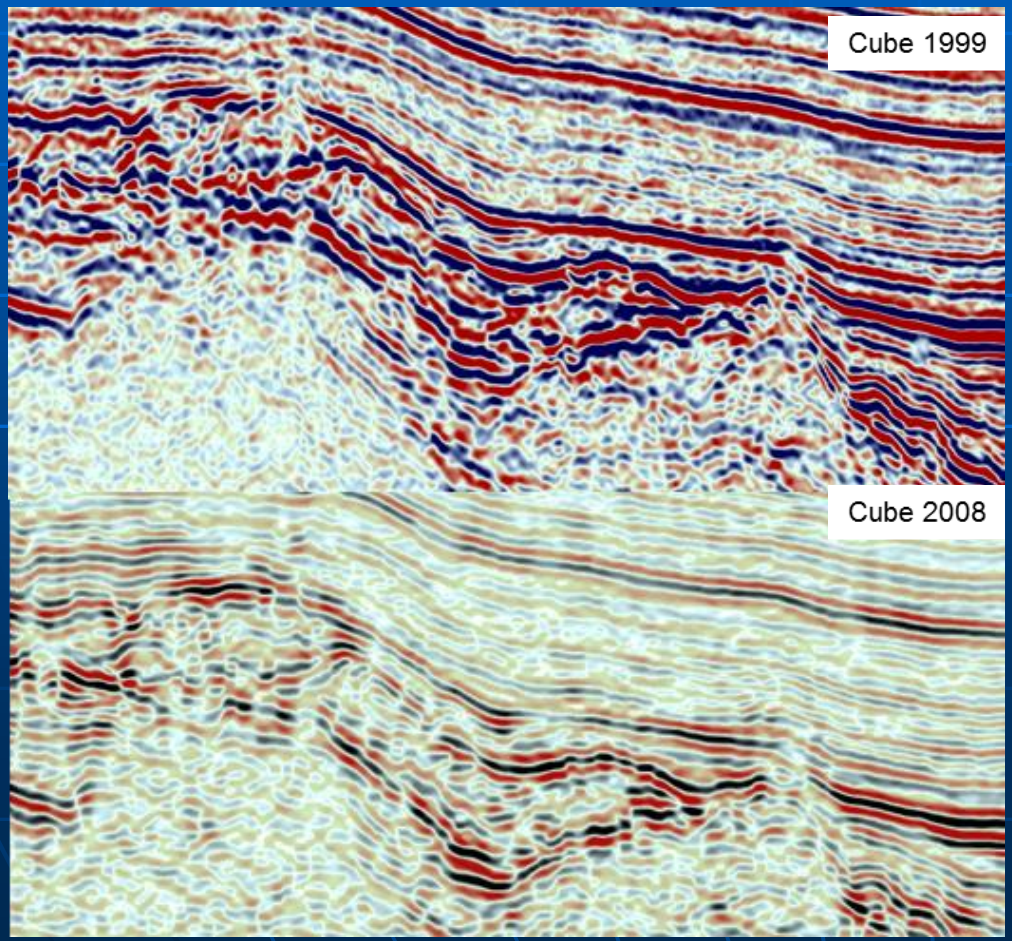


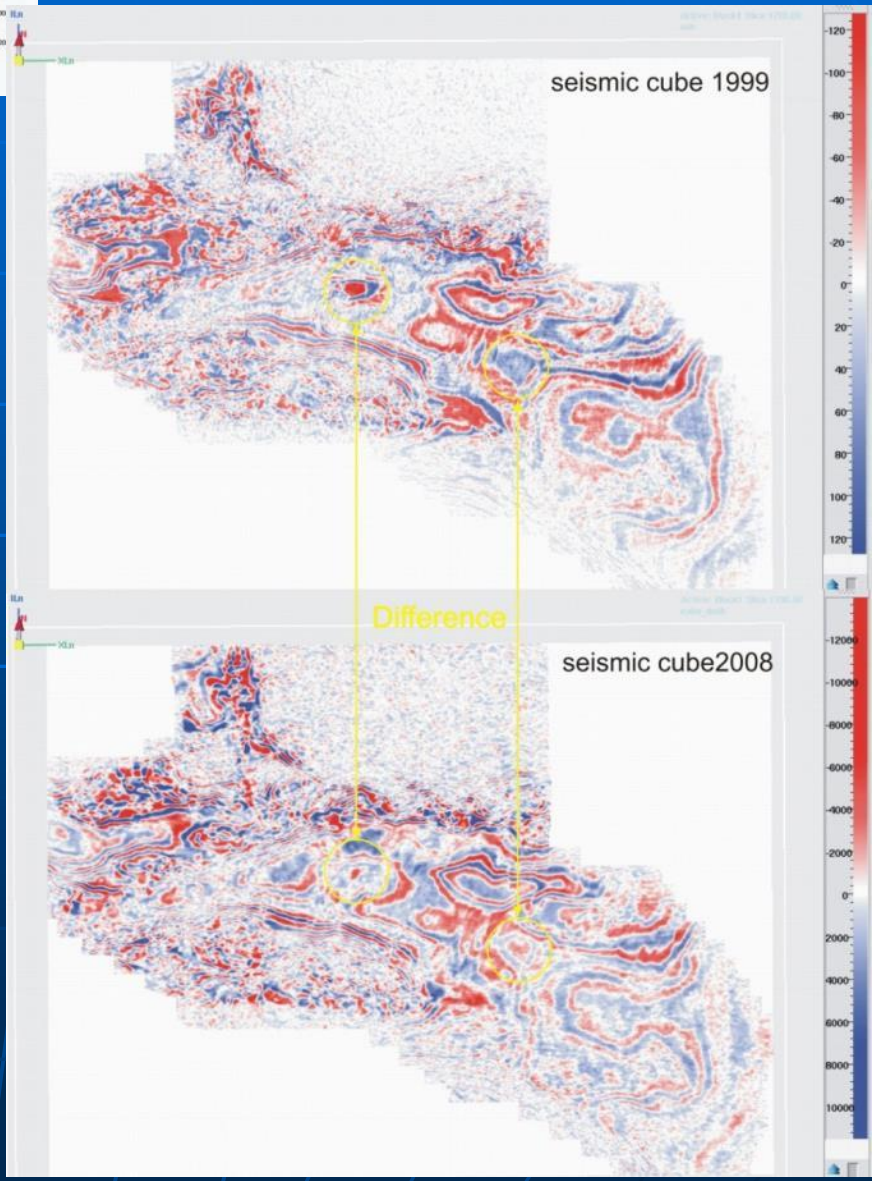
234 km^2

Acquisition 1997

Processing from 1998 to 1999

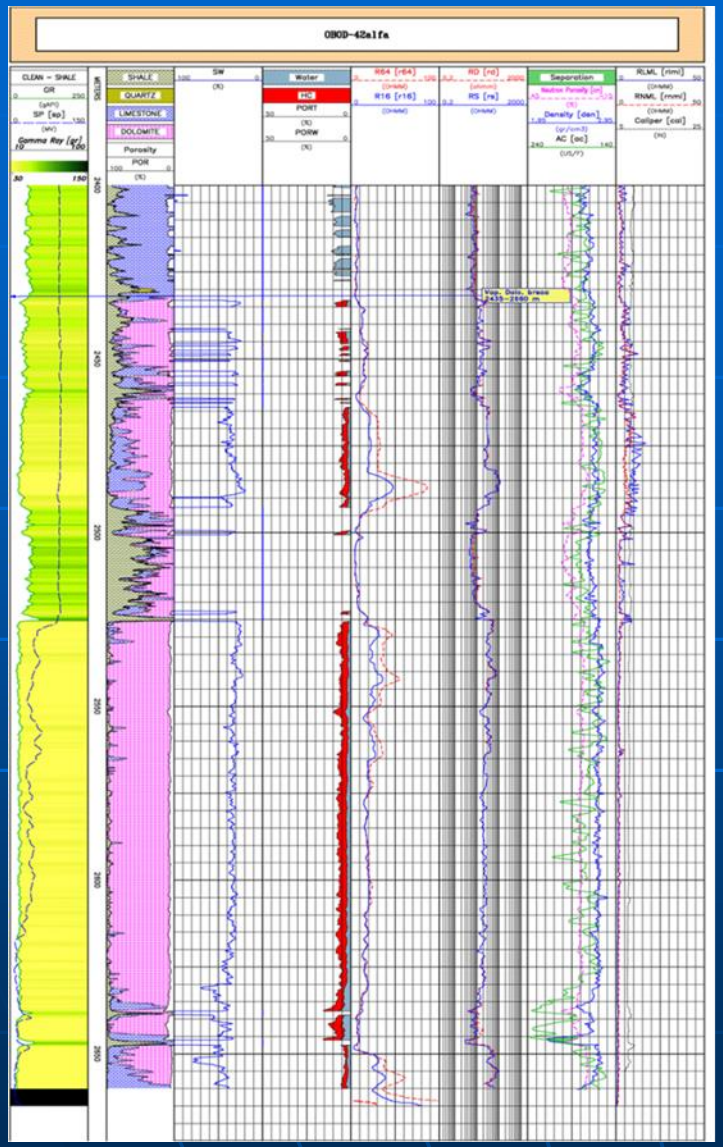
Reprocessing 2008

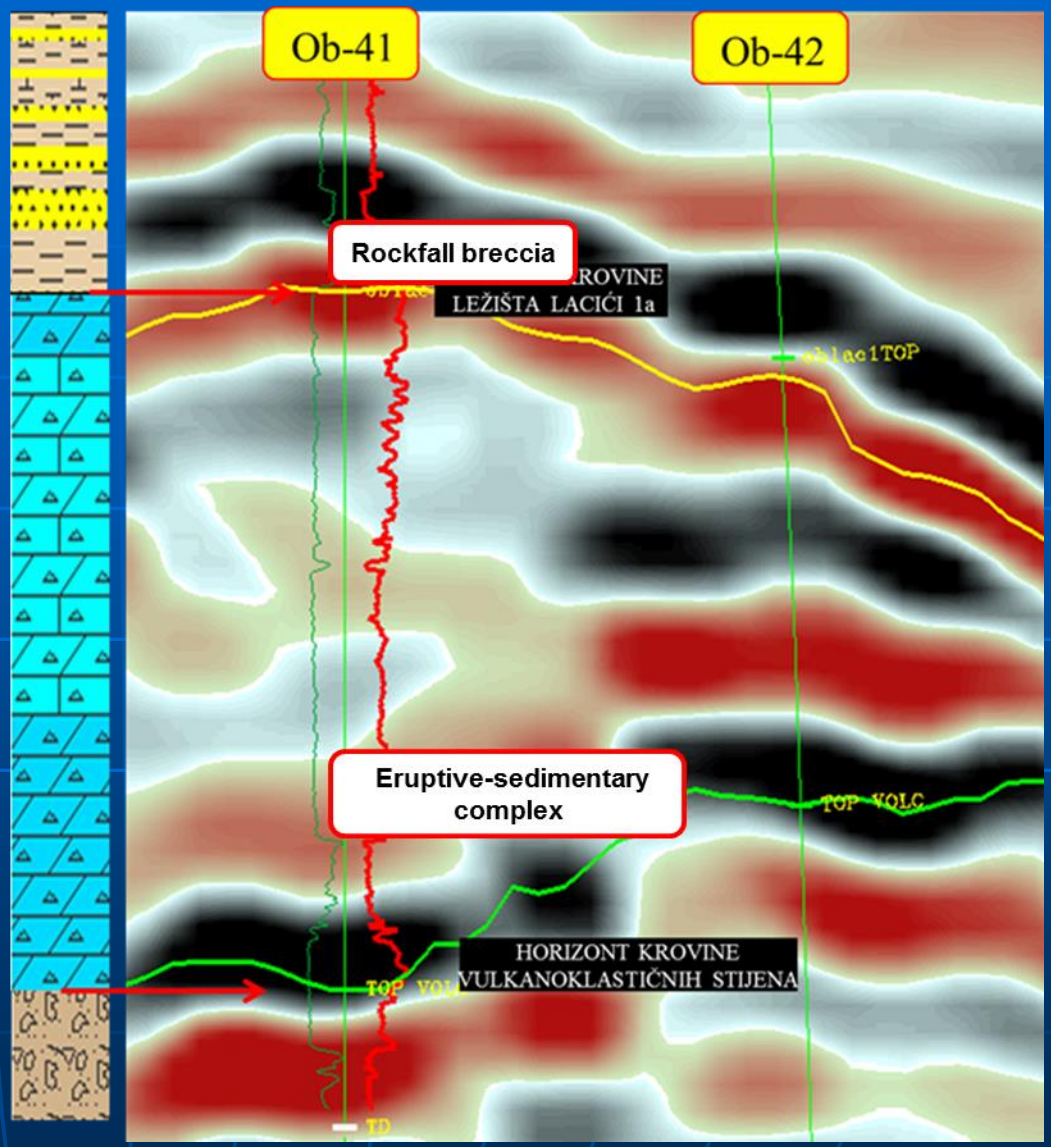


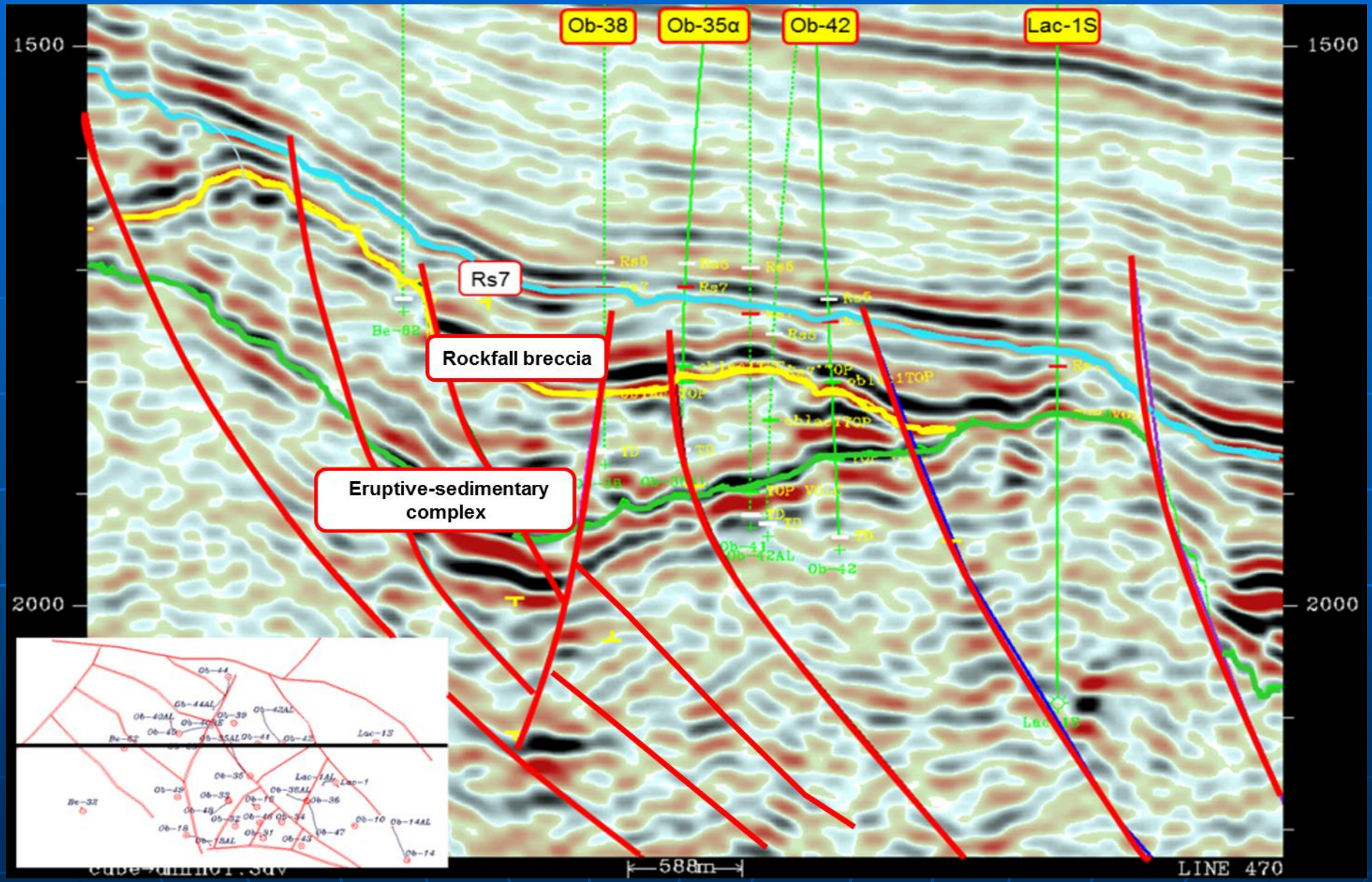


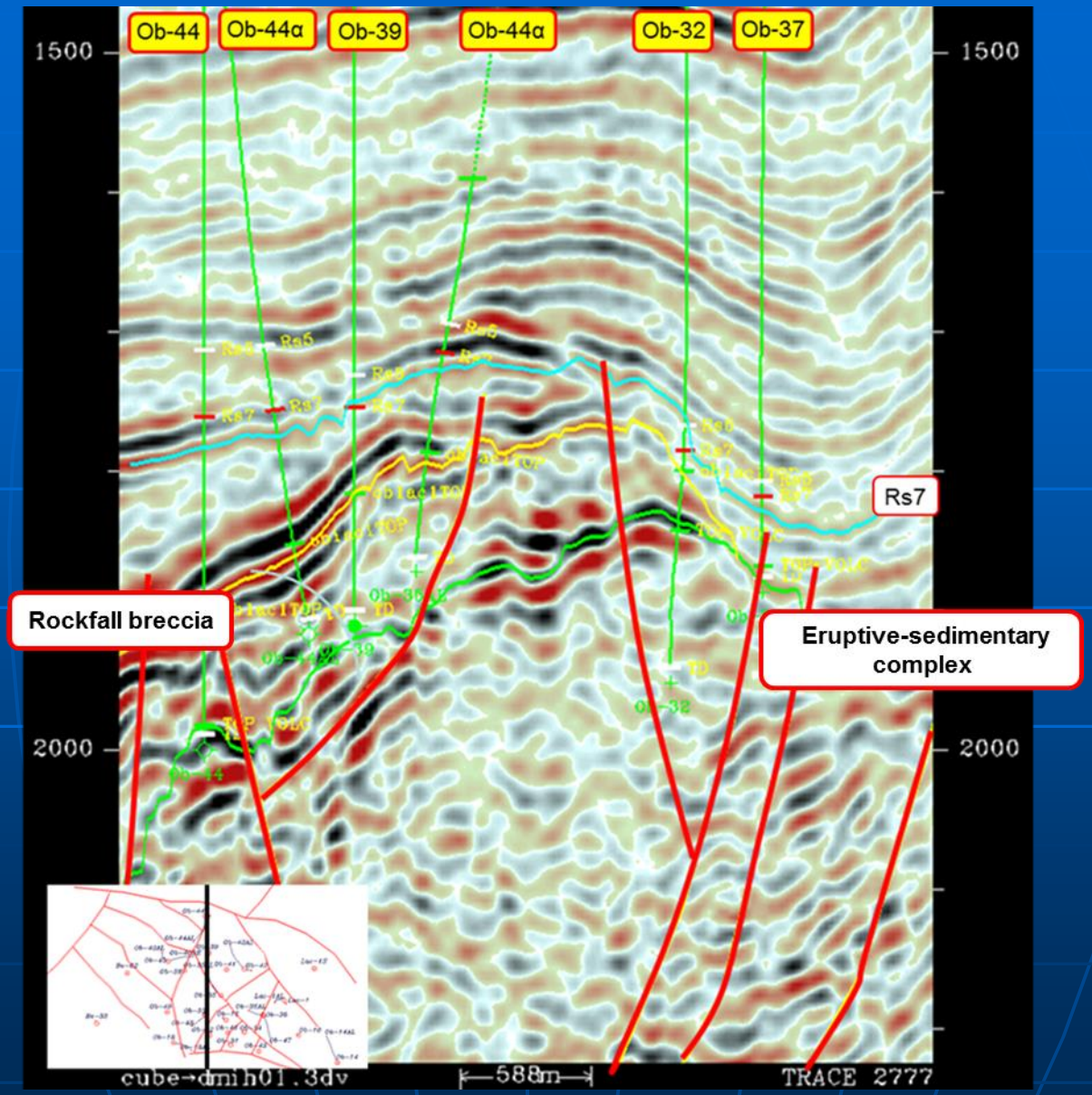
3.

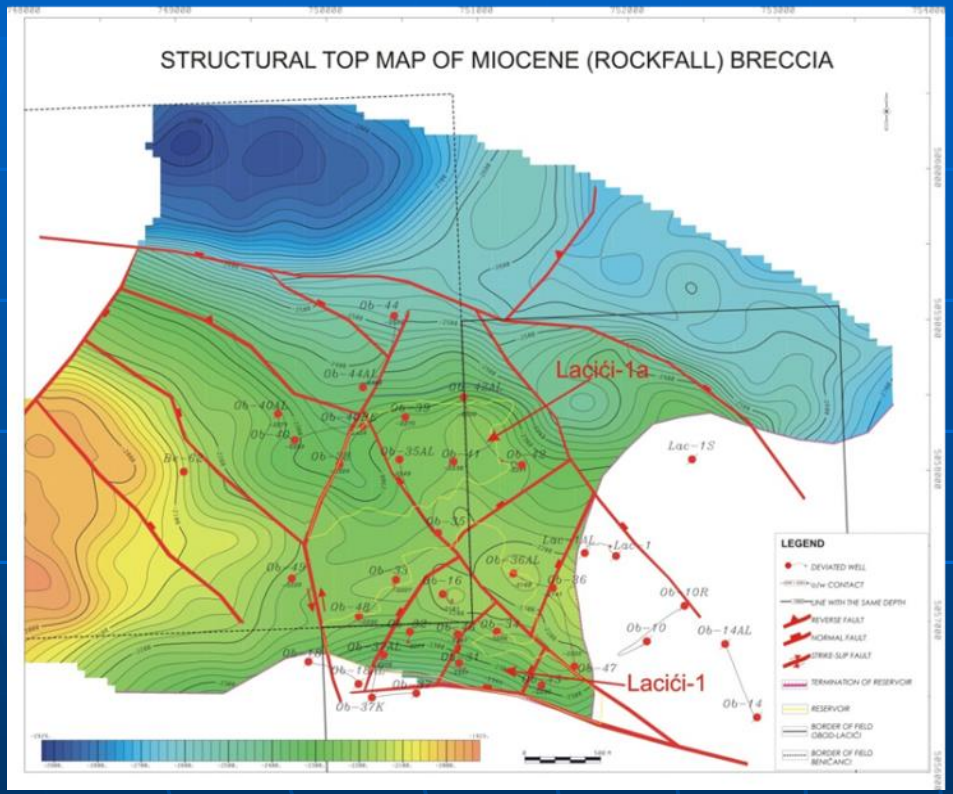
3D SEISMIC INTERPRETATION0

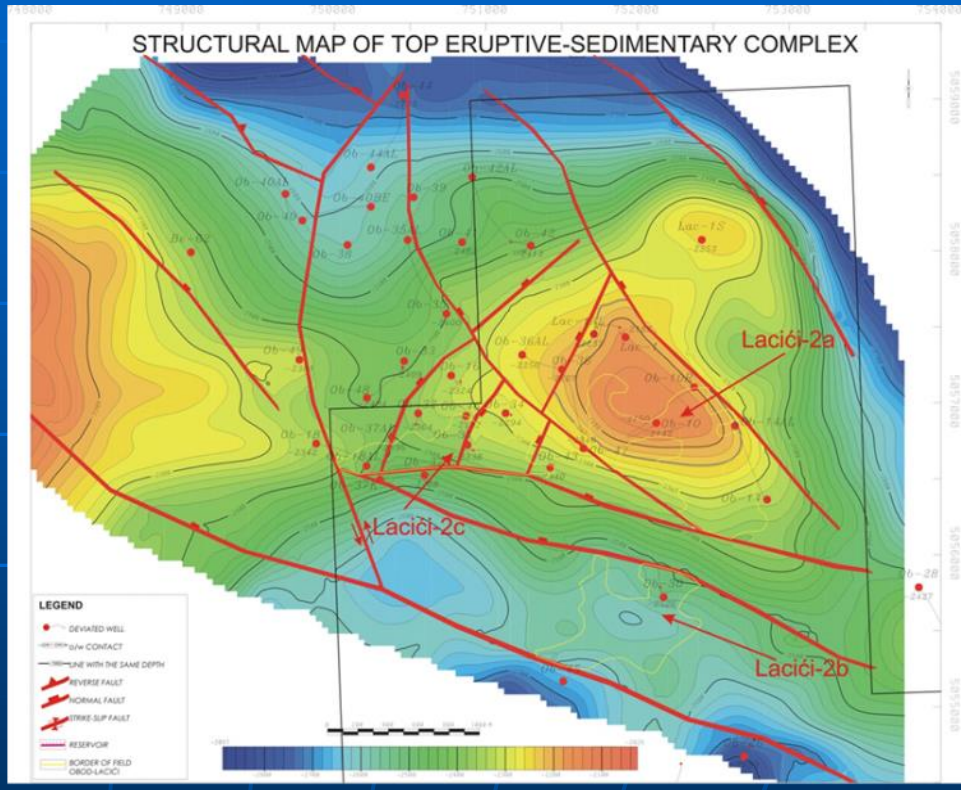

OBOD-42alfa
CLEAN – SHALE
GR
SP [sp]
Gamma Ray [gr]
SHALE
QUARTZ
LIMESTONE
DOLOMITE
Porosity
POR
SW
Water
HC
PORT
PORW
RS [rs]
Separation
Density [den]
AC [ac]
Caliper [cal]
RLML [rlml]
RNML [rnml]

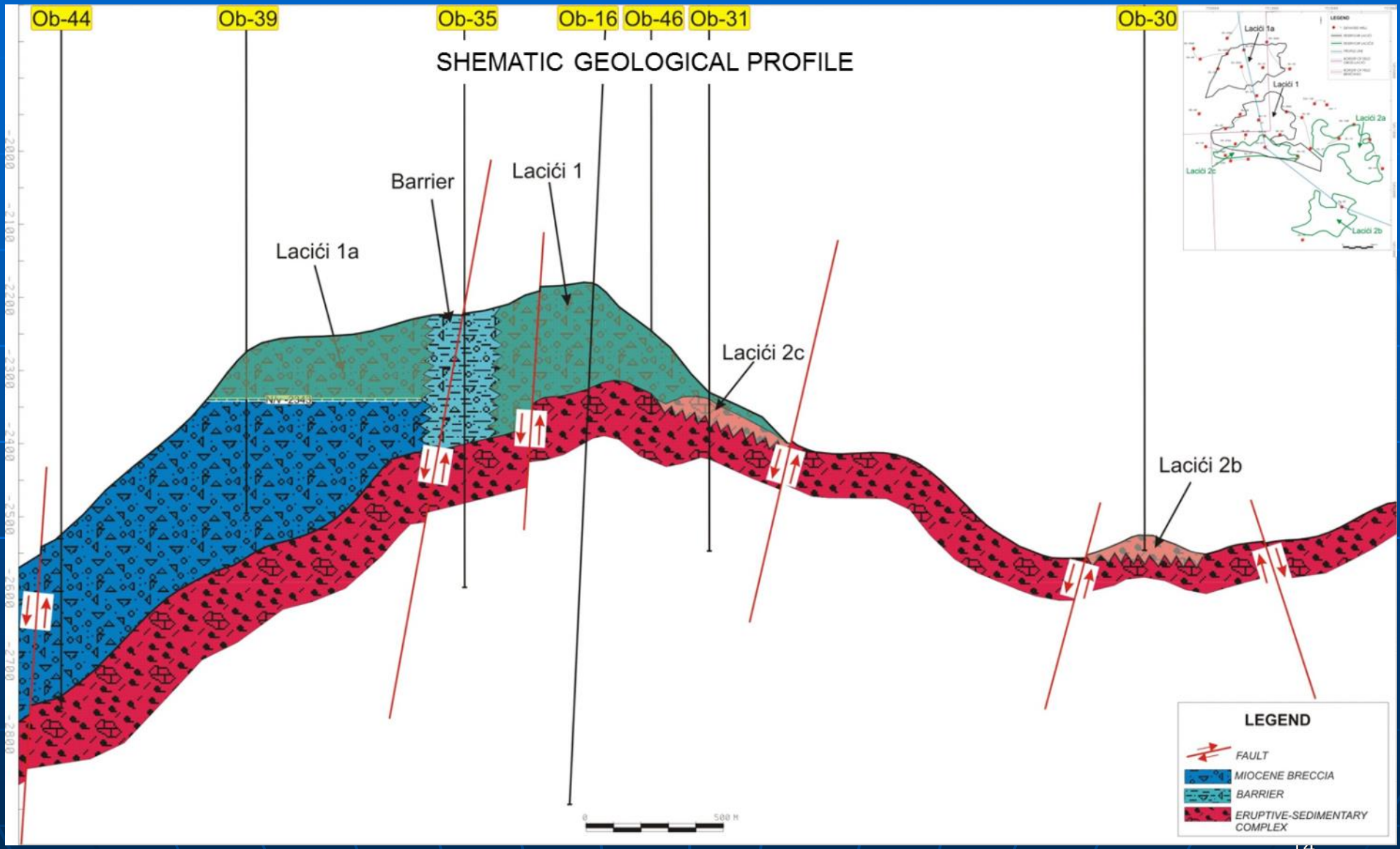

Ob-41
Ob-42
Rockfall breccia
KROVINE
LEŽIŠTA LACIĆI 1a
Eruptive-sedimentary complex
TOP VOLC
HORIZONT KROVINE
VULKANOKLASTIČNIH STIJENA
TD


Ob-38
Ob-35α
Ob-42
Lac-1S
1500
2000
Rs7
Rockfall breccia
Eruptive-sedimentary complex
588m
LINE 470


Ob-44
Ob-44α
Ob-39
Ob-44α
Ob-32
Ob-37
1500
1500
2000
2000
Rs7
Rockfall breccia
Eruptive-sedimentary complex
cube→dmih01.3dv
588m
TRACE 2777

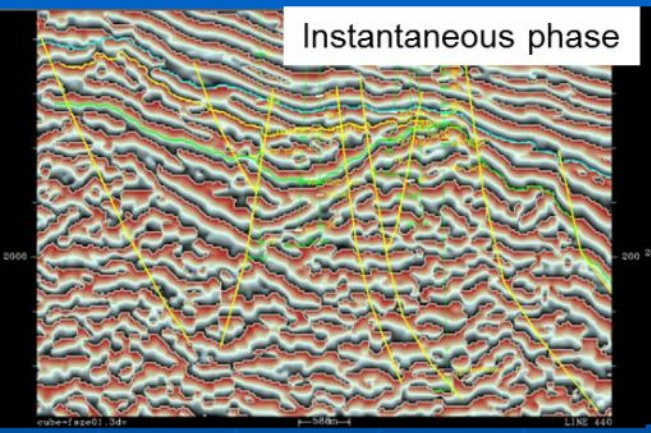

STRUCTURAL TOP MAP OF MIOCENE (ROCKFALL) BRECCIA
Lacići-1a
Lacići-1
LEGEND
DEVIATED WELL
o/w CONTACT
LINE WITH THE SAME DEPTH
REVERSE FAULT
NORMAL FAULT
STRIKE-SLIP FAULT
TERMINATION OF RESERVOIR
RESERVOIR
BORDER OF FIELD OBOD-LACIĆI
BORDER OF FIELD BENIČANCI

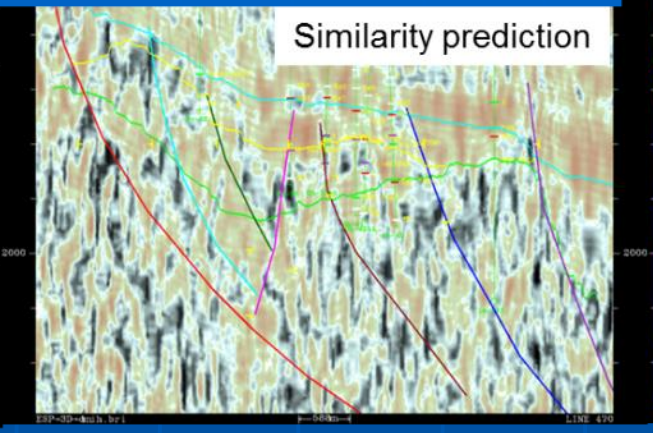

STRUCTURAL MAP OF TOP ERUPTIVE-SEDIMENTARY COMPLEX
Lacići-2a
Lacići-2c
Lacići-2b
LEGEND
DEVIATED WELL
o/w CONTACT
LINE WITH THE SAME DEPTH
REVERSE FAULT
NORMAL FAULT
STRIKE-SLIP FAULT
RESERVOIR
BORDER OF FIELD OBOD-LACIĆI

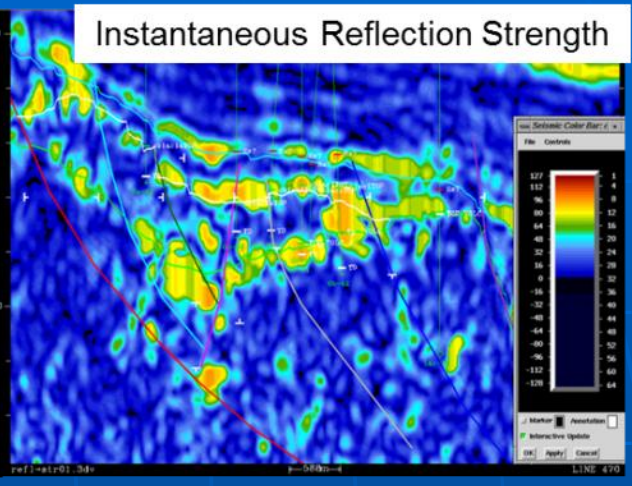

Ob-44
Ob-39
Ob-35
Ob-16
Ob-46
Ob-31
Ob-30
SHEMATIC GEOLOGICAL PROFILE
Barrier
Lacići 1
Lacići 1a
Lacići 2c
Lacići 2b
LEGEND
FAULT
MIOCENE BRECCIA
BARRIER
ERUPTIVE-SEDIMENTARY COMPLEX

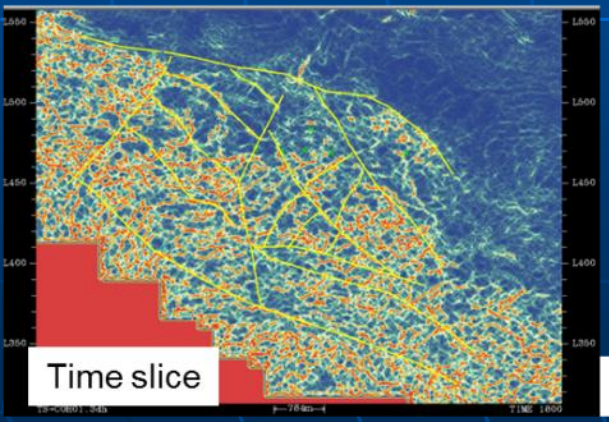
4.

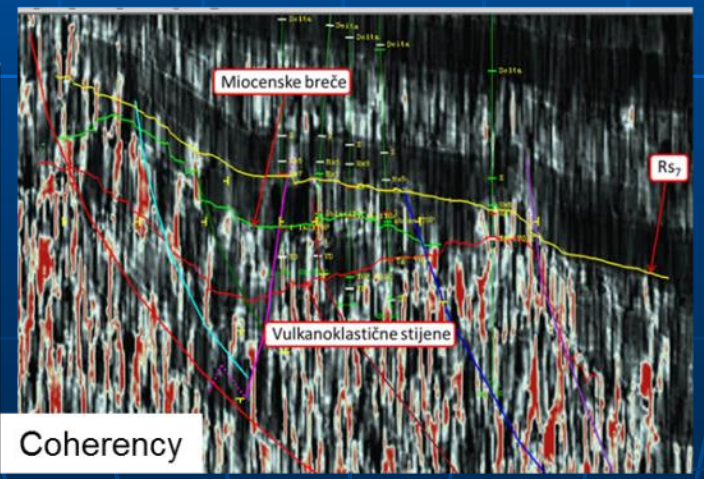
SEISMIC ATTRIBUTE ANALYSIS

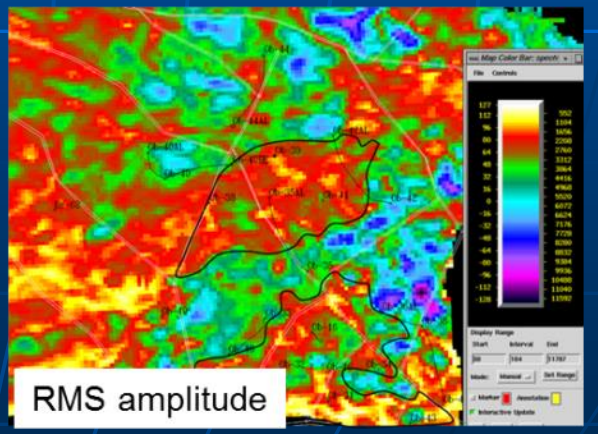

Instantaneous phase

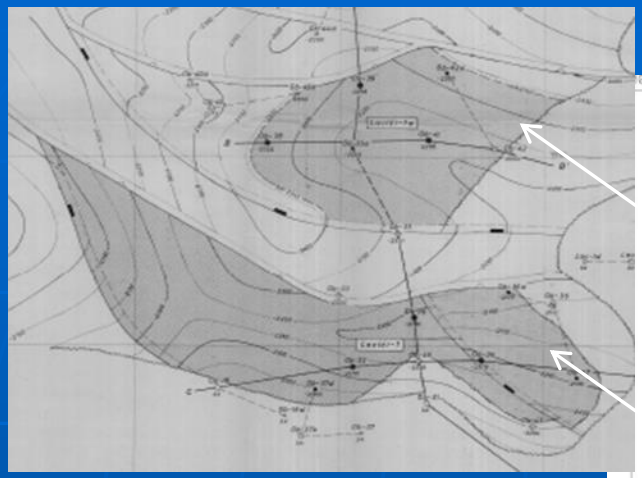

Similarity prediction

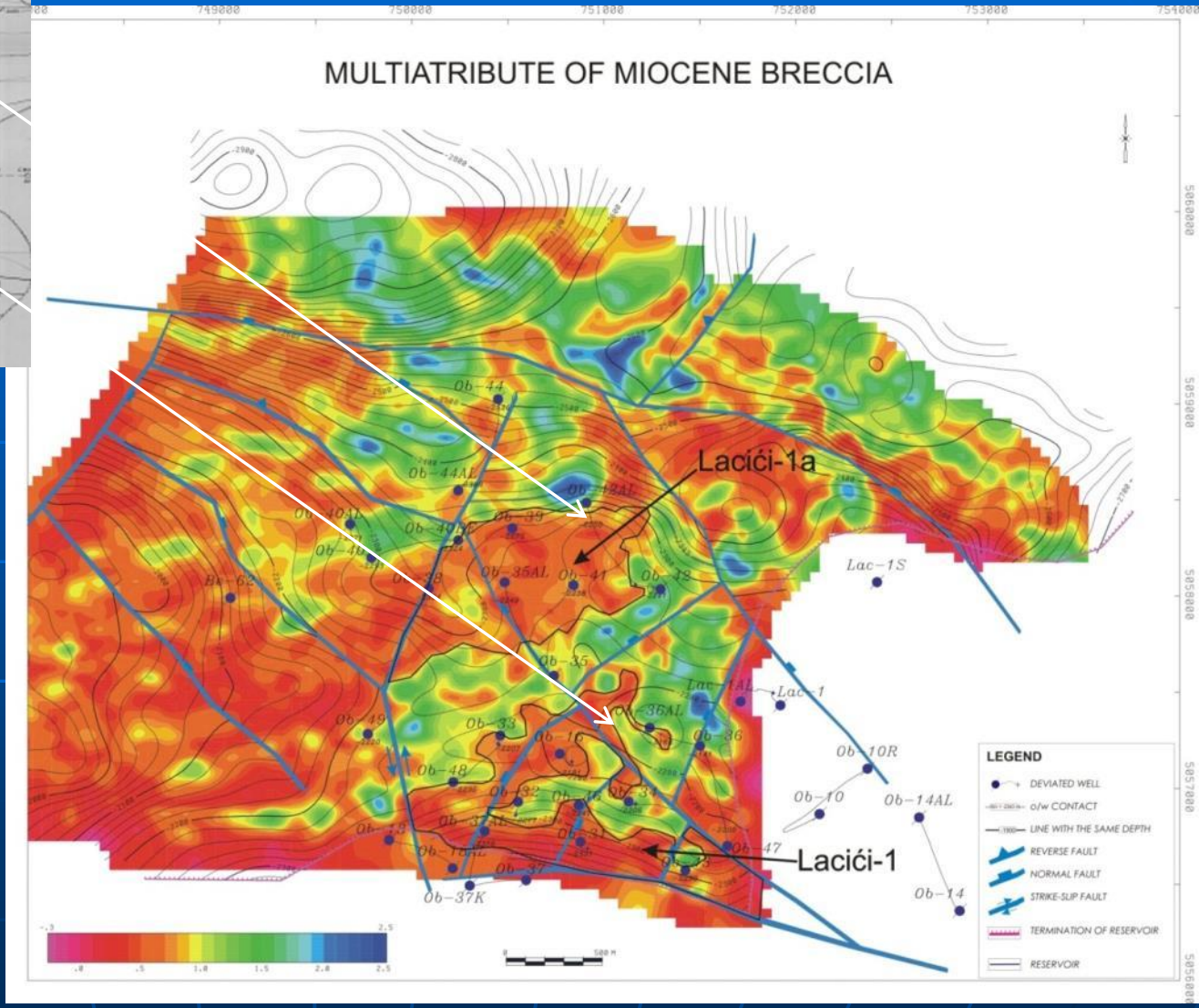

Instantaneous Reflection Strength


Time slice


Miocenske breče
Rs7
Vulkanoklastične stijene
Coherency


RMS amplitude





- The method of multiattributes was developed in order to reduce ambiguity of each seismic attribute analysis.
- In reservoirs with secondary porosity established the existence of an inverse relationship amplitudes and saturation in the reservoir.
- multiattribute were the main aspect of seismic analyses
- Multiattribute as HC saturation indicator in this case is the product of RMS amplitude and instantaneous frequencies
- Seismic anomaly correspond to previous interpretation
- o/w contact fit to border of anomaly polygon
- Possible extension of reservoir Lacići 1a to the south part of field
- Possible reduction of reservoir Lacići 1 on the west part of field

CONCLUSION

- Seismic reprocessing allowed easier tracking of horizons during interpretation
- Interpreted horizons: Rs_7, top of rockfall breccia and top of eruptive-sedimentary complex
- Interpreted complex tectonic-most valuable information for future EOR project in term of CO2 injection
- Extraction of seismic attribute provide information about lithology variation in breccias reservoir
- Combination of several attribute analysis point out better quality of reservoir characteristic in breccia